Claims

The listing of the claims will replace all prior versions, and listing, of claims in the application:

Listing of Claims:

Claim 1 (currently amended): A method for making a two-phase polymeric material, comprising the steps of:

immobilizing a lyotropic liquid crystal by treatment with a ~~polyion-type~~ polyion compound, wherein the lyotropic liquid crystal comprises a solution of supramolecules in a solvent, the supramolecules comprise molecules of a modified organic substance, the molecules each have one or more modifying functional groups, and the ~~polyion-type~~ polyion compound is capable of forming counterions for the modifying functional groups;

exerting an external orienting force to order the immobilized lyotropic liquid crystal;

substantially removing the solvent to form a first phase that comprises a film of the ordered, immobilized organic molecules; and

forming a second phase that comprises a polymeric matrix by treating the film with a binding agent.

Claim 2 (original): The method of Claim 1, wherein the lyotropic liquid crystal is formed by concentrating a solution of supramolecules.

Claim 3 (original): The method of Claim 1 wherein the organic molecules are discotic molecules of the modified organic compound.

Claim 4 (original): The method of Claim 1, wherein the concentration of the lyotropic liquid crystal in the solution is in the range of approximately 3% to 50% by mass.

Claim 5 (original): The method of Claim 1, wherein the concentration of the lyotropic liquid crystal in the solution is in the range of approximately 7% to 15% by mass.

Claim 6 (original): The method of Claim 1, wherein the solvent is water.

Claim 7 (original): The method of Claim 1, wherein the solvent comprises water and an organic solvent that is miscible with water.

Claim 8 (original): The method of Claim 1, wherein the steps of the external orienting action and the solvent removal take place simultaneously.

Claim 9 (original): The method of Claim 1, wherein the modified organic substance has the general formula

$$\{R\}(F)_n,$$

where R is a polycyclic organic compound with conjugated π bonds, F is a modifying functional group, and n is the number of modifying functional groups.

Claim 10 (original): The method of Claim 9, wherein the modifying functional groups are ionogenic, and wherein the ionogenic groups have associated therewith one or more counterions.

Claim 11 (original): The method of Claim 9, wherein the modifying functional groups are nonionogenic.

Claim 12 (original): The method of Claim 1, wherein the lyotropic liquid crystal further comprises a surfactant or a mixture of surfactants with a concentration of less than approximately 5% by mass.

Claim 13 (original): The method of Claim 1, wherein the lyotropic liquid crystal further comprises a plasticizer or a mixture of plasticizers with a concentration of less than approximately 5% by mass.

Claim 14 (original): The method of Claim 1, wherein the polyion compound is selected from oligomers, polymers, and their blends, and wherein the interaction of the polyion compound with the ionogenic groups does not disturb the lyotropic liquid crystal.

Claim 15 (original): The method of Claim 1, wherein the external orienting force comprises one or several external actions selected from the list consisting of an electric field, a magnetic field, and mechanical shear.

Claim 16 (original): The method of Claim 1, wherein the solvent is removed at a temperature in the range of approximately 20 to 60 °C and at a relative humidity greater than approximately 60%.

Claim 17 (original): The method of Claim 16, wherein the solvent is removed at a temperature of approximately 20 °C for less than approximately 3 hours.

Claim 18 (original): The method of Claim 1, wherein the formation of the second phase further comprises interaction of the reactive groups of the film of the ordered, immobilized organic molecules with molecules of the binding agent.

Claim 19 (original): The method of Claim 1, wherein the binding agent comprises an organic molecule selected from the class of organic substances containing nucleophilic reactive groups.

Claim 20 (original): The method of Claim 19, wherein the polymer matrix is formed by a condensation mechanism.

Claim 21 (original): The method of Claim 20, wherein the polymer matrix formation is initiated by chemical interaction.

Claim 22 (original): The method of Claim 1, wherein the binding agent comprises an organic molecule selected from the class of organic substances containing an electrophilic reactive group.

Claim 23 (original): The method of Claim 22, wherein the polymer matrix is formed by an ion mechanism.

Claim 24 (original): The method of Claim 23, wherein the polymer matrix formation is initiated by chemical interaction.

Claim 25 (original): The method of Claim 1, wherein the binding agent comprises a saturated or unsaturated compound.

Claim 26 (original): The method of Claim 25, wherein the polymer matrix is formed by a radical mechanism.

Claim 27 (original): The method of Claim 26, wherein the polymer matrix formation is initiated by thermal reaction or chemical interaction.

Claim 28 (original): The method of Claim 26, wherein the polymer matrix formation is initiated by UV radiation.

Claim 29 (original): The method of Claim 28, wherein the binding agent further comprises a photosensitizer with a concentration less than approximately 0.5% by mass.

Claim 30 (original): The method of Claim 29, wherein the polymer matrix formation is initiated by UV radiation.

Claim 31 (canceled)

Claim 32 (currently amended): The method of Claim [[31]] 1, wherein the binding agent further comprises a photosensitizer with a concentration less than approximately 0.5% by mass.

Claim 33 (original): The method of Claim 1, wherein the binding agent comprises a solution of at least one polymer that does not disturb the film of the ordered immobilized system of organic molecules.

Claim 34 (original): The method of Claim 33, wherein the binding agent further comprises a photosensitizer with a concentration less than approximately 0.5% by mass.

Claim 35 (original): The method of Claim 1, wherein the binding agent comprises a melt of at least one polymer that does not disturb the film of the ordered immobilized system of organic molecules.

Claim 36 (original): The method of Claim 35, wherein the binding agent further comprises a photosensitizer with a concentration less than approximately 0.5% by mass.

Claim 37 (original): The method of Claim 1, further comprising the step of:

drying the polymer matrix at a temperature greater than approximately 100 °C for less than approximately 10 hours.

Claim 38 (currently amended): A two-phase polymeric material, comprising:

a first phase comprising a partially crystalline film that comprises ordered, immobilized, organic molecules wherein the molecules contain at least one modifying functional group; and

a second phase comprising a polymer matrix, wherein the first phase comprises less than approximately 35% by mass of the material.

Claim 39 (original): The two-phase polymeric material formed by the method of Claim 1.

Claim 40 (original): The two-phase polymeric material of Claim 38, wherein the modifying functional groups are ionogenic.

Claim 41 (canceled)

Claim 42 (original): The two-phase polymeric material of Claim 38, further characterized in that the material is anisotropic and has a crystalline structure having an

interplanar spacing in the range of approximately 3.4±0.3 Å along one of the optical axes of the crystalline structure.

Claim 43 (canceled)

Claim 44 (original): The two-phase polymeric material of Claim 38, wherein the polymer matrix is formed from aromatic monomers and has a degree of polymerization greater than approximately 40.

Claim 45 (original): The two-phase polymeric material of Claim 38, wherein the polymer matrix is formed from aliphatic monomers and has a degree of polymerization greater than approximately 120.

Claim 46 (original): The two-phase polymeric material of Claim 38, wherein the polymer matrix has a molecular weight in the range of approximately 4000 to 20000.

Claim 47 (original): The two-phase polymeric material of Claim 38, wherein the polymer matrix has a molecular weight in the range of approximately 5000 to 8000.

Claim 48 (original): The two-phase polymeric material of Claim 38, wherein the polymer matrix further comprises plasticizers at a concentration of less than approximately 5% by mass.

Claim 49 (original): An optically anisotropic film comprising a layer of the two-phase polymeric material of Claim 38.

Claim 50 (original): The film of Claim 49, wherein the film is polarizing.

Claim 51 (original): The film of Claim 49, wherein the film is a retarder.

Claim 52 (original): The film of Claim 49, wherein the film further comprises additional isotropic and/or anisotropic layers.